

Topics 1, 5.1-5.3, Option G

Topic 1: Statistical analysis

Assessment Statement	Study information
1.1.1 State that error bars are a graphical representation of the variability of data.	What does variability of data mean? Draw an example graph with error bars and explain what the error bars show.
1.1.2 Calculate the mean and standard deviation of a set of values.	Use to excel to calculate the mean (average) and standard deviation of the following set of heights of plants (cm): 10, 15, 11, 9, 8, 11, 26, 10 Mean: _____ Standard Deviation: _____
1.1.3 State that the term standard deviation is used to summarize the spread of values around the mean, and that 68% of the values fall within one standard deviation of the mean.	Explain standard deviation in your own words. Feel free to use a diagram in your explanation.
1.1.4 Explain how the standard deviation is useful for comparing the means and the spread of data between two or more samples.	Create an example to illustrate this assessment statement. Give two example means and their standard deviations and compare them to determine if they are statistically different.

1.1.5 Deduce the significance of the difference between two sets of data using calculated values for t and the appropriate tables.	<p>Two populations of plants were grown in two different areas. A researcher wants to determine if they have significantly different heights. Use excel to determine if these two populations are significantly different. Population 1 (cm): 10, 15, 11, 9, 8, 11, 26, 10 Population 2 (cm): 18, 24, 22, 24, 21, 19, 28, 12</p> <p>t-test: _____ Does this mean they are significantly different? _____ Explain.</p>
1.1.6 Explain that the existence of a correlation does not establish that there is a causal relationship between two variables.	<p>Explain correlation.</p> <p>Explain the difference between correlation and causation.</p>

5.1 Communities and ecosystems

Assessment Statement	Study information
5.1.1 Define species, habitat, population, community, ecosystem and ecology.	<p>Species:</p> <p>Habitat:</p> <p>Population:</p> <p>Community:</p> <p>Ecosystem:</p> <p>Ecology:</p>

<p>5.1.2 Distinguish between autotroph and heterotroph.</p>	<p>Define autotroph and give an example.</p> <p>Define heterotroph and give an example.</p> <p>Explain how they are different.</p>
<p>5.1.3 Distinguish between consumers, detritivores and saprotrophs.</p>	<p>Define consumer and give an example.</p> <p>Define detritivore and give an example.</p> <p>Define saprotroph and give an example.</p> <p>Explain how these three are different.</p>
<p>5.1.4 Describe what is meant by a food chain, giving three examples, each with at least three linkages (four organisms).</p>	<p>Draw a food chain with four organisms.</p> <p>Explain what a food chain shows.</p>
<p>5.1.5 Describe what is meant by a food web.</p>	<p>Define food web.</p>

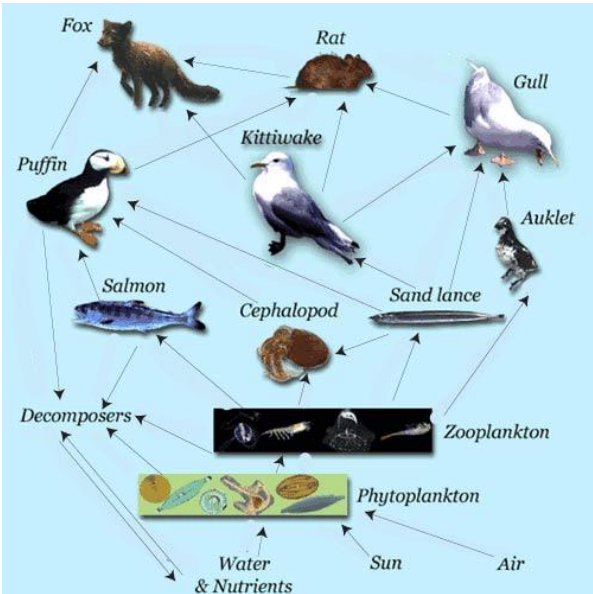
5.1.6 Define trophic level.

Define it and give an example of a trophic level.

5.1.7 Deduce the trophic level of organisms in a food chain and a food web.

Draw an example food chain with four organisms.

Identify the trophic level of each organism.



Label the trophic level of each organism in this food web. Do not label the decomposers.

5.1.8 Construct a food web containing up to 10 organisms, using appropriate information.

Construct a food web with 10 organisms from a jungle ecosystem.

5.1.9 State that light is the initial energy source for almost all communities.	Explain the role of light as an energy source for all communities.
5.1.10 Explain the energy flow in a food chain.	Explain energy flow using a food chain. Identify the type of energy that is transferred and the type of energy that is lost.
5.1.11 State that energy transformations are never 100% efficient	<p>Draw an example energy pyramid using 4 organisms from different trophic levels.</p> <p>Explain how energy is “lost” from an energy pyramid.</p>
5.1.12 Explain reasons for the shape of pyramids of energy.	Refer to the energy pyramid you drew for 5.1.11 in your explanation of this assessment statement.
5.1.13 Explain that energy enters and leave ecosystems, but nutrients must be recycled.	Explain how energy enters and leaves an ecosystem.

	Explain how nutrients are recycled.
5.1.14 State that saprotrophic bacteria and fungi (decomposers) recycle nutrients.	<p>Do decomposers recycle energy? _____ Explain.</p> <p>Explain how decomposers recycle a specific nutrient.</p>

5.2 The greenhouse effect

Assessment Statement	Study Information
5.2.1 Draw and label a diagram of the carbon cycle to show the processes involved.	Diagram the carbon cycle. Make sure you label the following processes: cellular respiration, photosynthesis, decomposition, organic carbon transfer, combustion, and fossilization.
5.2.2 Analyse the changes in concentration of atmospheric carbon dioxide using historical records.	<p>Go to: http://www.esrl.noaa.gov/gmd/ccgg/trends/</p> <p>Look up trends in the change of carbon dioxide levels and sketch a graph below.</p> <p>Describe the trend change over time.</p>

<p>5.2.3 Explain the relationship between rises in concentrations of atmospheric carbon dioxide, methane and oxides of nitrogen and the enhanced greenhouse effect.</p>	<p>Describe the greenhouse effect using a diagram. Explain the role of the greenhouse gases.</p>
<p>5.2.4 Outline the precautionary principle.</p>	<p>Define the precautionary principle.</p> <p>Give an example of its use.</p>
<p>5.2.5 Evaluate the precautionary principle as a justification for strong action in response to the threats posed by the enhanced greenhouse effect.</p>	<p>Should the precautionary principle be used to reduce the greenhouse effect? Yes it should. Explain why.</p> <p>No it should not. Explain why.</p>
<p>5.2.6 Outline the consequences of a global temperature rise on arctic ecosystems.</p>	<p>Give an example organism in the arctic and state how increased temperature will affect it.</p>

5.3 Populations

Assessment Statement	Study Information
5.3.1 Outline how population size is affected by natality, immigration, mortality and emigration.	Define each word and state how population size is affected by changes in it. Natality: Immigration: Mortality: Emigration:
5.3.2 Draw and label a graph showing a sigmoid (S-shaped) population growth curve.	Draw a sigmoid curve (x-axis labeled time, y-axis labeled population size). Be sure to label the exponential, plateau, and transitional phases on the curve.
5.3.3 Explain the reasons for the exponential growth phase, the plateau phase and the transitional phase between these two phases.	Explain each phase. Make sure to use natality, immigration, mortality, and emigration in your answers. Exponential growth phase: Plateau phase: Transitional phase:
5.3.4 List three factors that set limits to population increase.	Identify 3 – 4 limiting factors.

G1 Community ecology

Assessment Statement	Study Information
G.1.1 Outline the factors that affect the distribution of plant species, including temperature, water, light, soil pH, salinity and mineral nutrients.	<p>Explain how plant distribution is affected by</p> <p>Temperature:</p> <p>Water:</p> <p>Light:</p> <p>Soil pH:</p> <p>Salinity (salt concentration):</p> <p>Mineral nutrients (such as nitrogen):</p>
G.1.2 Explain the factors that affect the distribution of animal species, including temperature, water, breeding sites, food supply and territory.	<p>Explain how animal distribution is affected by</p> <p>Temperature:</p> <p>Water:</p> <p>Breeding Sites:</p> <p>Food supply:</p> <p>Territory:</p>

	Mutualism:
G.1.7 Explain the principle of competitive exclusion.	Define the competitive exclusion principle.
G.1.8 Distinguish between fundamental and realized niches.	<p>Define fundamental niche.</p> <p>Define realized niche.</p> <p>Explain the difference between these two types of niches.</p>
G.1.9 Define biomass.	Draw a biomass pyramid and explain biomass.
G.1.10 Describe one method for the measurement of biomass of different trophic levels in an ecosystem.	Explain how to measure biomass using named example organisms.

G2 Ecosystems and biomes

Assessment Statements	Study Information
G.2.1 Define gross production, net production and biomass.	<p>Define</p> <p>Gross production:</p> <p>Net production:</p> <p>Biomass:</p> <p>Write the equation for gross production.</p>
G.2.2 Calculate values for gross production and net production using the equation: gross production – respiration = net production.	<p>Gross production: $809 \frac{kJ}{m^2 yr}$</p> <p>Respiration: $729 \frac{kJ}{m^2 yr}$</p> <p>What is net production? (include units!!) _____</p>
G.2.3 Discuss the difficulties of classifying organisms into trophic levels.	Explain why it is difficult to classify some organisms into only one trophic level.
G.2.4 Explain the small biomass and low numbers of organisms in higher trophic levels.	<p>Identify a tertiary consumer. _____</p> <p>Explain why there are less of these organisms in the ecosystem than organisms lower in the food chain. Give at least two reasons.</p>
G.2.5 Construct a pyramid of energy, given appropriate information.	Construct an energy pyramid including the organisms from the food web in 5.1.7.

<p>G.2.6 Distinguish between primary and secondary succession, using an example of each.</p>	<p>Define primary succession and give an example.</p> <p>Define secondary succession and give an example.</p> <p>Explain the difference between the two types of succession.</p>
<p>G.2.7 Outline the changes in species diversity and production during primary succession.</p>	<p>Answer the assessment statement. Be sure to include lichen (and explain what these organisms are) and explain diversity changes up to a climax community.</p>
<p>G.2.8 Explain the effects of living organisms on the abiotic environment, with reference to the changes occurring during primary succession.</p>	<p>Answer the assessment statement. Be sure to include the role of lichen, worms, birds, and other specific organisms on changes to the abiotic environment (rocks, soil, water content, etc.)</p>
<p>G.2.9 Distinguish between biome and biosphere.</p>	<p>Define biome.</p> <p>Define biosphere.</p> <p>How are biomes different from the biosphere?</p>

G3 Impacts of humans on ecosystems

Assessment Statement	Study Information
G.3.1 Calculate the Simpson diversity index for two local communities.	<p>Write the Simpson diversity index:</p> <p>Explain what each letter in the formula represents.</p> <p>D:</p> <p>N:</p> <p>n:</p>
G.3.2 Analyse the biodiversity of the two local communities using the Simpson index.	<p>Area 1, $D = 4.2$ Area 2, $D = 4.9$</p> <p>Compare the biodiversity of each of these areas. Be sure to explain species richness versus species evenness in your answer.</p>
G.3.3 Discuss reasons for the conservation of biodiversity using rainforests as an example.	<p>Using the rainforests as an example give one ethical, ecological, economic, and aesthetic reason for preserving this ecosystem.</p> <p>Ethical reason:</p> <p>Ecological reason:</p> <p>Economic reason:</p> <p>Aesthetic reason:</p>
G.3.4 List three examples of the introduction of alien species that have had significant impacts on ecosystems.	<p>Invasive/alien species example 1: _____</p> <p>Was this a deliberate or accidental release? _____</p> <p>Explain the impact on the ecosystem:</p>

	<p>Invasive/alien species example 2: _____</p> <p>Was this a deliberate or accidental release? _____</p> <p>Explain the impact on the ecosystem:</p> <p>Invasive/alien species example 3: _____</p> <p>Was this a deliberate or accidental release? _____</p> <p>Explain the impact on the ecosystem:</p>
G.3.5 Discuss the impacts of alien species on ecosystems.	<p>For each example you listed in G.3.4, explain why the species was so successful in its new environment.</p> <p>Invasive/alien species 1: _____</p> <p>Reason for success:</p> <p>Invasive/alien species 1: _____</p> <p>Reason for success:</p> <p>Invasive/alien species 1: _____</p> <p>Reason for success:</p>
G.3.6 Outline one example of biological control of invasive species.	<p>Explain an example of biological control.</p> <p>Was it successful? _____</p> <p>Explain.</p>
G.3.7 Define biomagnification.	<p>Biomagnification:</p>
G.3.8 Explain the cause and consequences of biomagnification, using a named Example.	<p>Mercury biomagnification.</p> <p>Cause:</p>

	<p>Consequence in ecosystem:</p> <p>DDT (pesticide) biomagnification. Cause:</p> <p>Consequence in ecosystem:</p>
G.3.9 Outline the effects of ultraviolet (UV) radiation on living tissues and biological productivity.	<p>Effect of UV radiation on living tissues:</p> <p>Effect of UV radiation on biological (plant/microbial) productivity:</p>
G.3.10 Outline the effect of chlorofluorocarbons (CFCs) on the ozone layer.	<p>Explain the reaction between CFCs and O₃ (ozone).</p>
G.3.11 State that ozone in the stratosphere absorbs UV radiation.	<p>Explain the beneficial role of the ozone layer.</p>